Tech

U. S. DEPARTMENT OF COMMERCE

Technical News Bulletin

of the

National Bureau of Standards

★ *Issued Monthly* ★

Washington MAY 1936 Number 229

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MAY 1936
DETROIT

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COLORING OF STEEL

The coloring of steel by means of films of oxides of iron formed on the surface is a subject of frequent inquiry, the well-known temper colors formed by heating steel to a temperature several hundred degrees above room temperature being of especial interest. These colors range from light straw color to blue, blue being the color most frequently desired.

This tempering treatment frequently has its chief object in securing of suitable physical properties. Often, however, coloring is the chief object, not only for ornamentation but for securing some protection against corrosion.

The prevalent opinion is that the temper colors depend only on temperature, blue requiring the highest temperature and yellow the lowest. Experiments at the Bureau, however, indicate that the color obtained is greatly influenced by the length of time the material is maintained at a given temperature. The relationship between time and temperature is now being investigated. The time and temperature required also vary with the composition of the steel. Temper colors are due to light interference by an oxide film of varying thickness. The yellow color is due to interference and extinction of light of relatively short wave length, and blue to extinction of light of longer wave length, a thicker film being required.

DETERMINATION OF OXYGEN IN STEEL

One of the most dependable methods for the determination of oxygen in steel requires the fusion of the sample in vacuo. One difficulty repeatedly encountered by investigators, is the interference of manganese, unavoidably present in the sample of steel. In previous work at the Bureau in developing the method, it was found that manganese contents as low as 0.24 percent caused appreciable interference. However, it appears now that with present-day apparatus, manganese interference is not nearly so serious as it was with the apparatus

previously used. The employment of high-capacity pumps for the more rapid removal from the furnace chamber of the gases evolved from the melted sample, is the improvement principally responsible for reducing the amount of the manganese interference.

ARC AND SPARK SPECTRA OF COLUMBIUM

In 1801 the English chemist, Charles Hatchett, discovered a new element in a mineral found in Massachusetts, and named it "columbium." For more than a century, this element remained a chemical curiosity, neglected by physical and technical investigators. Columbium metal of high purity was prepared by Dr. C. W. Balke in 1929, and electrodes were generously presented to the Bureau for spectroscopic studies. Recently, the metal has been given an important use in the steel industry. When alloyed in moderate and economical proportions with chromium-nickel steels, it inhibits intergranular corrosion, and at the present time at least a ton a day is being refined and used for this purpose.

Since the use of spectra for chemical identification and quantitative analysis is developing rapidly, it will not be long before practical spectroscopists will need a satisfactory description of columbium spectra. No comprehensive and accurate measurements of wave lengths have ever been published for columbium, but this deficiency will be remedied by a paper in the May number of the Journal of Research (RP881), which describes the conventional arc and spark spectra throughout the entire range which can be photographed with large spectrographs in air. Wave-length measurements are presented for 5,700 lines, the average probable error being less than 1 part in a million. These data should facilitate spectroscopic identification and analysis of columbium, and serve as a basis for further study of spectral structures, magnetic effects, and hyperfine structures.

SOIL-CORROSION STUDIES, 1934

In 1922 the Bureau undertook to determine whether and to what extent soils were responsible for the deterioration of underground pipe. To accomplish this, about 7,000 specimens of commonly used pipe materials were buried. It soon became evident that some soils were corrosive, and in an attempt to find a remedy for underground corrosion, specimens of other materials and of protective coatings were added until the total number amounted to approximately 31,500 specimens. Of these, about 22,000 have been removed and examined. The report on approximately 2,000 ferrous specimens removed in 1934 will be published as RP883 in the May number of the Journal of Research. The results given in this and earlier reports can be summarized as follows:

Soil conditions, even within a very limited area, are so varied that the result of a single or a very few observations of corrosion is of little value. In order to determine the corrosiveness of a soil or the life of a pipe line a large number of observations must be made. The value of deepest pit (average of several observations) on an area of pipe surface exposed to a single soil condition will increase if the area is increased, i. e., one can expect to find a deeper pit on 100 feet of pipe than on 10 feet of pipe in the same soil. Pitting data are not comparable unless the observations are for equal areas exposed for the same time to the same soil. In most soils the rate of corrosion decreases with time, but for some soils the penetration is nearly proportional to the period of exposure.

The average value of the maximum pit after 12 years of soil action is slightly less for wrought iron than for the other commonly used pipe materials, but the standard error of the averages indicates that the apparent differences in the materials may be accidental or within the limits of errors of observation. The average values of penetration for both pure open-hearth iron and for open-hearth steel to which 0.2 percent of copper has been added are rather definitely higher than for the more commonly used pipe materials. In some soils, especially those containing so-called alkali, cast iron corrodes somewhat more rapidly than steel, but the corrosion products appear to have more strength as pipe material. The several varieties of cast iron, with the exception of one containing 15 percent of nickel, corrode at approximately the same rates.

The addition of a small percentage of chromium to steel reduces the loss of weight but has little effect on the maximum pit depth. Indeed, in soils containing chlorides the corrosion may be concentrated and accelerated. Very limited data suggest that the addition of nickel with or without chromium tends to reduce both loss of weight and pit depths.

EFFECT OF MAGNESIA ON PORTLAND CEMENT

Excessive amounts of magnesia are known to affect adversely the strength, soundness, and volume changes of portland cement. There are indications that the intensity of these changes is related to the state of the magnesia in the clinker. As a preliminary step in the quantitative determination of this relation, studies were made of the boundaries of primary phase volumes in the quaternary system lime-magnesia-dicalcium silicate-pentacalcium-trialuminate. It was found that the magnesia as primary phase occupies a relatively large volume. In some compositions magnesia becomes the primary phase in concentrations as low as 5 percent, and in all compositions it becomes the primary phase in concentrations of more than 33 percent. A complete account of this work will be published as RP884 in the Journal of Research for May. A diagram will be included showing the primary phase relations of magnesia in the quaternary system.

INFLUENCE OF PARTIAL PREHYDRATION AND CURING TEMPERATURES ON CEMENT AND CONCRETE

The possibility of producing cements having low heats of hydration by treating standard and high-early-strength portland cements with steam at atmospheric pressure was recently investigated at the Bureau. Two different degrees of hydration were studied, the ignition loss of each cement being increased to approximately 3 and 5 percent, respectively. The effects of these partial hydrations of the cements on the heats of hydration and on the compressive strengths of concretes made of the cements were determined for the ages of 7, 28, 90 days, and 1 year for different curing temperatures. The resistance of mortar bars, made of the untreated and of the prehydrated cements, to the disintegrating action of sodium sulfate solutions was studied by determining the expansion of mortar bars immersed in these solutions. It was found that the 3-percent prehydration of the standard portland cements caused a reduction in the average heat of hydration at 7 days of approximately 13 percent, but at 1 year this reduction amounted to only about 6 percent of the heat of hydration of the untreated cements. The 5-percent prehydration of these cements caused a reduction in the average heat of hydration at 7 days of approximately 30 percent, and at 1 year a reduction of about 20 percent. The prehydrations of the high-early-strength cements caused only about two-thirds the decrease in the average heat of hydration that was found (for the same degrees of prehydration) for the standard portland cements.

The heats of hydration of the 5-percent prehydrates of the standard portland cements all fell within the upper limits specified for low-heat cements used in the construction of Boulder Dam.

The compressive strengths of concretes made of the prehydrated cements were all lower than the compressive strengths of the concretes made of untreated cements. This reduction was greatest at 7 days and decreased with age. The 5-percent prehydration reduced the strength to a greater extent than the 3-percent at all ages. The standard and high-early-strength cements cured at 70° F. had greater strengths up to 90 days than the Boulder Dam cements, but after that age the increase in strength of the Boulder Dam cements exceeded that of the other two types. At 150° F. curing, the Boulder Dam cements had strengths of the same order as the untreated portland at all ages.

The expansion measurements showed that, with the exception of cements with high tricalcium aluminate content, the prehydrations increased the resistance of the cements to the disintegrating action of sodium sulfate solutions. The 5-percent prehydrates had greater resistance to the sulfate action than the 3-percent.

For a complete account of this work, RP887 in the May number of the Journal of Research should be consulted.

CALCULATING AIR PERMEABILITY OF A STRUCTURAL UNIT COMPOSED OF TWO MATERIALS

The cubic centimeters of air flowing under 1 g pressure per second through 1 cm^3 of a porous material has been defined as the "permeability factor" of that material. In the study of pore structure, the air permeabilities of a large number of bricks and other porous materials have been determined, and their mean average pore diameters also determined according to the Poiseuille formula.

From these materials a group of five specimens was selected, having a wide range in pore size and permeability, and used for a study of the effect on the permeability by combining differ-

ent systems of two specimens at a time.

The two specimens were placed flat, one above the other, with a narrow felt gasket between, and sealed in a box with mercury around the vertical sides of the unit. Air under constant pressure was passed vertically through the unit and the permeability factor determined.

When F is the permeability factor of a unit or combination of two specimens, f_1 and f_2 their permeability factors, respectively, and t_1 and t_2 their respective thicknesses, then

$$F=\frac{f_1 f_2}{f_1 t_2+f_2 t_1}.$$

In the second column of the following table are given the permeability factors as determined experimentally for five different combinations and in the third column the flow factors are given as calculated from the equation.

Combination	Permeability factor		Difference
	Experimental	Calculated	
A+B	0.03268	0.03271	0.00003
A+C	.01667	.01677	.00010
A+D	.01319	.01319	0
B+E	.01313	.01317	.00004
C+E	.01035	.01039	.00004

With the exception of combination A+D, the results as determined are slightly less than the calculated ones, which may be ascribed to the resistance to flow caused by the felt gasket imposed between the two specimens or to the inherent errors of measurement. The results indicate that the equation can be used to determine the permeability of a structural unit composed of two materials when the individual permeability and thickness of each material are known.

ROUTINE DETERMINATION OF BORON IN GLASS

New methods of analysis, if shown to be reliable, are always welcome by chemists. Through their use, it is sometimes possible to obtain results in shorter time and with less special equipment than are required by existing methods. When this can be done without material sacrifice of accuracy, such methods are especially acceptable.

Boric oxide is a common constituent of many commercial glasses, and the Bureau is studying its effect on some of their physical properties. As part of this work, a method was developed for the determination of boron which is simpler, more rapid, and approximately as accurate as the current recognized methods.

Chemists can now analyze glass for boric oxide by a simple, direct, and accurate method, without using elaborate apparatus. This method, which is based on the "partition" of boric acid between water and ether in the presence of hydrochloric acid and ethanol, is described in detail in RP882 in the May number of the Journal of Research.

PETROLEUM OIL TABLES

Tables giving the volume changes in petroleum oils with change of temperature are the basis for many of the calculations involved in the refining and distribution of petroleum products. The increasing use of heavier oils, some of which have a specific gravity greater than that of water, has created a demand for tables covering the numerical constants of these heavier oils and has made it desirable to consolidate all data in one publication. The Bureau has, therefore, prepared a new circular (C410, National Standard Petroleum Oil Tables) which replaces C154, originally published in 1924, and of which over 14,000 copies have been printed and sold. The tables were computed and compiled by the National Bureau of Standards and are based on experimental work in its laboratories. They have been approved and accepted by the American Petroleum Institute, the American Society for Testing Materials, and the United States Bureau of Mines and are in general use in the petroleum oil industries.

The new circular contains all the tables in circular C154, and in addition, tables 1, 2, 4, and 5 are extended to include the heavy petroleum products not covered in the original publication. The degree API tables are extended to include the range 10 to 0 degrees API at 60° F. In this connection, it may be pointed out that:

$$\text{Degrees API}=\frac{141.5}{\text{sp gr } 60°/60°\text{ F}}-131.5.$$

Copies of the new circular are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 20 cents each.

ACCELERATED WEATHERING TEST FOR ASPHALTS AND OTHER MATERIALS

Actual outdoor exposure furnishes a satisfactory quality test for materials that deteriorate rapidly, but, obviously, this method of test is not applicable to materials which are intended to withstand long periods of exposure with but little alteration.

An accelerated weathering test, in which samples are exposed alternately to light and heat from a carbon-arc lamp, a period of refrigeration, and a period during which water is forcefully sprayed on the surfaces that have been exposed to the light, has been in use at the Bureau for several years in studying the weathering characteristics of such materials and is being used by a number of testing laboratories and manufacturers.

Experiments at the Bureau have shown that the weathering process gradually transforms bituminous materials, cotton, wool, rubber, and similar materials into products that are soluble in water. A modified accelerated weathering test has, therefore, been developed in which immersion in distilled water is substituted for the water spray. This method permits the products of weathering to be collected for further examination. A more complete description of the apparatus and procedure will be found in the May number of the Journal of Research (RP 886).

WEATHERING QUALITY OF ROOFING FELTS

Owing to the increasing scarcity of suitable rags, the need for substitute materials is a problem confronting the manufacturer of paper felts and prepared roofings. In order to determine the effect of different fibers on the life and serviceability of asphaltic roofing materials, an investigation was made at the Bureau by the Research Associate of the manufacturing and industrial research committee of the Asphalt Shingle and Roofing Institute. Experimental felts composed of cotton rags, old jute and manila bagging, old newspapers, sulphite pulp, and wood sawdust were made for the investigation and exposed outdoors to determine their behavior to weathering. Inspection and tests showed that there was no significant difference in the resistance to weathering of asphalt roofing which may be attributed to the kind of fiber or combination of fibers employed. A more complete report of this work will be published as RP888 in the May number of the Journal of Research.

ALKALI DEGRADATION OF WOOL PROTEIN

Previous work has shown that the disulfide group constitutes one of the most important connecting links in the wool molecule. The disulfide group is particularly susceptible to attack by alkalies and, as a result, wool is readily degraded by alkaline reagents. In addition to its importance in practical wool processing, the problem of labile sulfur in biological materials has recently become one of the most important in biochemical research.

Labile sulfur is an arbitrary name given to that portion of the sulfur which splits off from sulfur-containing substances on treatment with various alkalies or with alkaline solutions of various reagents such as lead acetate, lead nitrate, etc. It is obvious that the value obtained for the amount of labile sulfur will depend on the method used and the specific conditions of treatment. There have been postulated several mechanisms, which will be discussed later, for the splitting of sulfur from cysteine, cystine, and other mercaptans and disulfides. In the case of proteins, however, results which have appeared to be anomalous have led a number of investigators to assume the existence of a number of sulfur combinations in proteins.

RP885 in the May number of the Journal of Research, describes the behavior of sulfur in wool under conditions which are very different from those ordinarily used in studies on sulfur liability, and points out a probable mechanism by which sulfur is split from wool during alkali treatment. The data indicate that the primary process in the alkali cleavage of the disulfide linkage consists in a hydrolytic rupture of the disulfide group with the formation of a sulfydryl compounds and a sulfenic acid. The sulfenic acid is extremely reactive and unstable in alkaline solution and immediately loses hydrogen sulfide and forms an aldehyde. The results of the investigation indicate that the existence of labile sulfur in proteins is not an indication that the bulk of the sulfur is present in more than one form.

MATTRESSES FOR HOSPITALS

The Bureau has just issued Commercial Standard CS54-35, Mattresses for Hospitals. This pamphlet presents the results of a cooperative effort of the American Hospital Association, manufacturers, and the Bureau to provide hospitals with a standard specifi-

cation for the purchase of mattresses, and manufacturers with a basis for certification of quality.

The specification covers inner-spring mattresses upholstered with hair or cotton-felt filling, and hair-filled mattresses. Two types of inner-spring construction are described; All-metal; and cloth pocket. Three grades of curled hair are specified: Grade A, 50-percent horse-mane hair and 50-percent horse-tail hair; grade B, all cattle-tail hair; and grade C, all horse-mane hair. One grade of cotton felt is specified. Section I of the standard covers inner-spring mattresses, using either type of inner-spring construction, and with any one of the three grades of hair filling or with cotton-felt filling. Section II covers hair mattresses without inner-spring, filled with any one of the three grades of hair.

The commercial standard describes the requirements for workmanship, materials, springs, casing of spring unit, ticking, tufting, stitching, twine, construction of edges and corners, ventilators and lifting straps. Test methods for resiliency and temper of springs are included. Over-all dimensions, minimum number of springs, minimum number of tufts, and minimum weight of hair or cotton filling are given for eight sizes of mattresses. Test methods for cleanliness of hair and for the absence of second-hand cotton linters are included. Specifications for the length of horse-mane and horse-tail hair, and for cattle-tail hair are given; test methods for color fastness of hair to perspiration and crocking are described. Cotton felt is described according to U. S. Department of Agriculture Service and Regulatory Announcement No. 125.

The standard provides that mattresses shipped by l. c. l. freight shall be packed in fiberboard or cardboard cartons. A recommended form of certification and labeling, a brief history of the project, membership of the standing committee, and a list of acceptors are also included.

Copies of CS54–35 are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

MATTRESSES FOR INSTITUTIONS

The Bureau has just released Commercial Standard CS55–35, entitled Mattresses for Institutions. This publication is a companion booklet to Mattresses for Hospitals, Commercial Standard CS54–35, and is intended to serve as a standard specification for the purchase of mattresses by institutions and to provide a basis for certification of quality. The specification was developed by the American Hospital Association in cooperation with manufacturers under the auspices of the Bureau.

This standard applies to three grades of hair-filled and two grades of cotton-filled mattresses. Grades are designated D, E, F, G, and H, to follow consecutively the three grades of mattresses covered by the Commercial Standard for mattresses for hospitals. The standard covers over-all size, workmanship, materials (such as ticking, tufting, thread, and stitching), edge, corners, lifting straps, and methods of test for cleanliness of hair and color fastness to both crocking and perspiration. The composition and length of hair for filling is specified. and two grades of cotton felt are described according to the U. S. Department of Agriculture Service and Regulatory Announcement No. 125.

Copies of CS55–35 are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

PAPER DISTORTION IN MULTICOLOR OFFSET PRINTING

The following is an abstract of a paper to be presented by C. G. Weber, of the Bureau's paper section, at the meeting of the Graphic Arts Research Bureau in Washington on May 11.

The distortion of paper in multicolor offset printing, with the attending difficulty of obtaining register of successive color prints, has been responsible for many serious difficulties. It appears also that, of the problems involving paper, distortion has been least clearly understood. The requirements of the offset process are exacting, in that the dimensions of paper must be held constant during printing. Practically all dimensional changes affecting register are caused by moisture content changes, and since paper is a highly hygroscopic substance with high coefficient of linear expansion per unit of moisture content change, constant moisture content must be maintained to avoid distortion. Results of the experimental work at the Bureau indicate that constant moisture content can be maintained by proper hygrometric treatment. However, best results require not only air conditioning in the press room, but complete control of the moisture content from the paper machine

to the printing press, plus special treatment to compensate for the effects of press moisture.

To meet all these requirements is difficult; however, two methods of obtaining the desired results have been found. Papers conditioned first to a very high moisture content, then to equilibrium with the pressroom atmosphere by desorption and printed under constant atmospheric conditions showed no distortion. Also, papers prepared for printing by conditioning to equilibrium with relative humidity 5 to 8 percent above the pressroom condition gave satisfactory results. The former condition will be obtained if the paper is never dried below hygrometric equilibrium with the pressroom condition. However, since most papers are dried to a moisture content of less than 5 percent in manufacture to permit calendering, this procedure is not feasible for general practice. The second method of treatment is more promising for most plants.

Where facilities are not available for conditioning paper to relative humidity 5 to 8 percent above the pressroom humidity, the moisture content should be adjusted at the mill, and the paper protected during transit and storage so that it will reach the printing plant with a moisture content 0.5 to 1.0 percent above equilibrium with humidity maintained in the pressroom. In no instance should paper be shipped with moisture content below equilibrium with the relative humidity of the pressroom it is to be used in, and it should always be adequately protected against changes of moisture content by water-resistant wrappers. If this procedure is followed, printing plant conditioning will be greatly simplified, and wavy edges will be avoided.

CONGRESSIONAL ACTION IN REFERENCE TO WEIGHTS AND MEASURES

Miscellaneous Publication M122, which was released last month, presents a detailed account of the steps taken to secure uniformity in weights and measures in the United States. It is an historical account of the various plans and proposals made in or to Congress on this subject, based upon actual records of Congress and other original documents, and culminating in the passage of the joint resolutions of Congress of 1836 and 1838.

The most important plans submitted on this subject were those of Thomas Jefferson and John Quincy Adams. Neither plan was adopted, but the reports of Jefferson and Adams have great historical and technical value for students in this field. The first act of Congress relative to establishing uniformity in weights and measures was the Surveyor Act of 1799, but since no standards had been adopted, this legislation was not put into effect at the time of its passage.

The first act of Congress to be put into effect promptly after passage was the Mint Act of 1828 adopting the troy pound and providing for uniformity in the weight of the coins of the United States. After the passage of this act, the work of securing uniformity in weights and measures was seriously begun. This work finally resulted in the construction and adoption of standards as provided in the joint resolutions of 1836 and 1838.

With the completion and delivery of the standards of weight and measure as provided for in these joint resolutions, there was at last established a ground work upon which a weights and measures structure, uniform throughout the country, could be erected. The legal basis having been laid down by these resolutions and by the Mint Act of 1828, it was then that the States began to proceed independently, but at the same time in reasonable harmony, to effect a practical control of this fundamental of Government—uniformity in the standards of weight and measure.

Copies of this publication are obtainable from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 5 cents each.

NEW AND REVISED PUBLICATIONS ISSUED DURING APRIL 1936

Journal of Research [1]

Journal of Research of the National Bureau of Standards, vol. 16, no. 4, April 1936 (RP874 to RP880, inclusive). Price, 25 cents. Obtainable by subscription.

Research Papers [1]

[Reprints from the February 1936 Journal of Research]

RP858. A standard source of ultraviolet radiation for calibrating photoelectric dosage intensity meters. W. W. Coblentz and R. Stair. Price, 5 cents.

[1] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, $2.50 per year (United States and its possessions, and Canada, Cuba, Mexico, Newfoundland, and the Republic of Panama); other countries, 70 cents and $3.25, respectively.

RP859. Treatment of offset papers for optimum register. Charles G. Weber and Martin N. V. Geib. Price, 5 cents.

RP860. A summary of information on the preparation and properties of pure iron. John G. Thompson and Harold E. Cleaves. Price, 5 cents.

RP861. Effect of yarn twist on the properties of cloth. Herbert F. Schiefer and Daniel H. Taft. Price, 5 cents.

RP862. Effect of number of warp and filling yarns per inch and some other elements of construction on the properties of cloth. Herbert F. Schiefer, Daniel H. Taft, and John W. Porter. Price, 5 cents.

RP863. Electrical-resistance alloys of copper, manganese, and aluminum. James L. Thomas. Price, 5 cents.

RP864. Action of "hypo" solution on stone tanks. Daniel W. Kessler. Price, 5 cents.

RP865. Note on the guarded-field X-ray ionization chamber. Lauriston S. Taylor and George Singer. Price 5 cents.

RP866. Mesle's chord method for measuring the thickness of metal coatings. William Blum and Abner Brenner. Price 5 cents.

RP867. Corrosion-protective value of electrodeposited zinc and cadmium coatings on steel. William Blum, Paul W. C. Strausser, and Abner Brenner. Price 5 cents.

Commercial Standards[1]

CS54–35. Mattresses for hospitals. Price 5 cents.

CS55–35. Mattresses for institutions. Price 5 cents.

Circulars[1]

C410. National standard petroleum oil tables. (Superseding C154.) 20 cents.

Miscellaneous Publications[1]

M122. Weights and measures in Congress. Historical summary covering the period of the Continental Congress to and including the adoption of the Joint Resolutions of 1836 and 1838. Sarah Ann Jones. Price 5 cents.

M156. Report of the 25th national conference on weights and measures (June 4, 5, 6, and 7, 1935). Price 20 cents.

Technical News Bulletin[1]

Technical News Bulletin 228, April 1936. Price 5 cents. Obtainable by subscription.

MIMEOGRAPHED MATERIAL

Letter Circulars

Letter Circulars are prepared to answer specific inquiries addressed to the National Bureau of Standards and are sent only on request to persons having a definite need for the information. The number of copies available is limited. The Bureau cannot undertake to supply lists or complete sets of Letter Circulars or to send copies automatically as issued.

LC464. Wood and shingle stains. (Supersedes LC64.)

LC465. Aluminum foil insulation.

Reports of National Hydraulic Laboratory

Copies are sent only in answer to specific requests addressed to the National Bureau of Standards.

Current Hydraulic Laboratory Research in the United States. Report No. IV–1 (January 1, 1936).

OUTSIDE PUBLICATIONS[2]

Une détermination absolue de l'ohm. Harvey L. Curtis, Charles Moon, and C. Matilda Sparks. Résumé etabli pour les procès-verbaux des séances du Comité International des Poids et Mesures (Paris, France), annexe E3, 222 (1935).

Determination absolue de l'ampère. Harvey L. Curtis and Roger W. Curtis. Résumé etabli pour les procès-verbaux des séances du Comité International des Poids et Mesures (Paris, France), annexe E4, 238 (1935).

[1] Send orders for publications under this heading only to the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscription to Technical News Bulletin, 50 cents per year; Journal of Research, $2.50 per year (United States and its possessions, and Canada, Cuba, Mexico, Newfoundland, and the Republic of Panama); other countries, 70 cents and $3.25, respectively.

[2] These publications are not obtainable from the Government. Request should be sent direct to the publishers.

Recent revisions of high temperatures. H. T. Wensel. J. Am. Ceramic Soc. (2525 N. High Street, Columbus, Ohio), 19, 81 (March 1936).

Aircraft: Materials and testing. L. B. Tuckerman. Proc. Am. Soc. Testing Materials (260 S. Broad Street, Philadelphia, Pa.), 35, part II, 3 (1935).

The air-conditioned offset pressroom. C. G. Weber. Heating, Piping, and Air Conditioning (Keeney Pub. Co., 6 N. Michigan Avenue, Chicago, Ill.), 8, 137 (March 1936).

Register studies in offset lithography. C. G. Weber and R. M. Cobb. Research Series no. 9 (Lithographic Technical Foundation, 220 E. Forty-second Street, New York, N. Y.) (April 1936.) (Reprint of BS J. Research 9, 427, 1932.)

Oxalic acid as an electrolytic etching reagent for stainless steels. G. A. Ellinger. Trans. Am. Soc. Metals (7016 Euclid Street, Cleveland, Ohio), 24, 26 (1936).

Standards for the Nation. Lyman J. Briggs. The Federal Employee (Labor Bldg., 10 Independence Ave. SW., Washington, D. C.), 21, 8 (March 1936).

U. S. GOVERNMENT PRINTING OFFICE: 1936